

*Batchelder (J. P.)*

**CHOLERA:**  
**ITS CAUSES,**  
**SYMPTOMS,**

AND

**TREATMENT,**  
**CONSIDERED AND EXPLAINED,**

BY

**J. P. BATCHELDER, M. D.,**  
**OF NEW YORK CITY.**

*Boyle*

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V  
BY J. P. BATCHELDER, M.D.,

OF NEW YORK CITY.

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## CHOLERA, &c.

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THE fact that through certain phenomena presented with tolerable uniformity by epidemics, there runs an analogy which, taken in connexion with circumstances attending their movements, progress, and termination, has led to the thought that their causes, although involved in impenetrable obscurity, may be few—similar—perhaps identical; while the effects they produced were modified by accidents, incident to their evolution, by circumstances pertaining to the subjects acted on; or by contingencies connected with season, climate, &c. This view, it must be admitted, accords well with the simplicity of Nature, who produces the greatest number and variety of effects from the fewest possible causes, in which her wisdom is apparent, and manifestly different from that of man, who is prone to overlook the simple means by which her vast machinery is put and kept in motion for the attainment of results the most grand and sublime. Ignorant of causes, we may, however, by watching the phenomena they originate, deduce the laws by which they are governed: and furthermore, by reasoning from effects, we are sometimes led to a knowledge of their causes.

By pursuing this method in respect to chemical affinity, gravitation, etc., philosophers have been able to deduce and settle their laws so firmly that we implicitly and unconsciously act on them in our daily pursuits; and by patient observance, careful analogy, and study of the phenomena of diseases, we have likewise become acquainted with the laws by which they are governed without knowing their causes. In respect to Cholera this method has been unfortunately too much neglected, and the attention has been diverted from its legitimate objects; hence the failure to ascertain and settle in a satisfactory manner, the laws by which its propagation from individual to individual is regulated and determined, and also its precise nature.

Having considered this part of the subject so far as it relates to contagion and infection, in another paper, we now proceed to inquire into the nature and symptoms of Cholera, and the causes by which they are induced, and the laws by which they are governed, and endeavor to ascertain whether they justify the conclusion that it is a disease *sui generis*.

Disease has been defined, "A derangement of the function or structure of an organ."\*

The performance of function depends on the normal action of the capillaries of the respective organs, modified by peculiarity of structure.

If the due performance of function depends on the healthy action of the capillaries, by a parity of reasoning, a derangement of function, which constitutes disease, must depend on the deranged action of those vessels. Now, the action of an organ as a whole, which is its function, and that of all its capillaries, is identical, and constitutes the function; and *e converso* what an organ as a whole does, that will all its capillaries do—they, then, it may be said, perform its function.

"The noiseless and printless feet of time" move not less stilly and imperceptibly in their rounds, than do the various organs in the body, in the healthy performance of their respective functions; therefore, in health, every function is performed in such a manner that the individual has no knowledge of it, or of the organ which performs it.

When the capillaries of an organ, and the fluids they contain, are normal, the sole cause which prompts the former to action, is the mere simple mechanical distension occasioned by the latter; but if that state either of the fluids or the capillary vessels is disturbed, derangement of function ensues.

From the altered condition of one or other of these (the fluids or the capillaries) disease arises, and the human body is so constituted, that change of action from the normal to the abnormal, if considerable, is perceived, and the perception of that change constitutes feeling; hence pains, aches, and disagreeable feelings,

\* Derangement of structure is secondary—if the result of disturbed function. If primary, it is the consequence of violence. In neither of these respects will it come within the scope of this inquiry.

which comprise a large and very important class of symptoms. The inference drawn from these premises is, that if the action of an organ is perceived it is a sign of disease.

If the sensibility of vessels is changed or altered, morbid action ensues, although the fluids should remain the same. On the other hand, if the fluids are contaminated, or altered in their physical or chemical properties, morbid action as certainly ensues. How? Changed in either of these particulars, the fluids make a novel, strange, and consequently disagreeable impression on the inner surface of the capillaries, which stimulates them to contract—the only real action of which they are capable; hence the rigor which ushers in malarious, infectious, and most endemic diseases, and also cholera proper, particularly in its cold stage; but in the former, as for example intermittent fever, small-pox, and measles, this contraction of the capillaries is general, and is soon succeeded or followed by a spontaneous relaxation. Hence the febrile excitement which ensues, and likewise the various kinds of inflammation that follow in train. In these last, small-pox, &c., the contraction is only general, and is followed by a spontaneous relaxation; but let us remark, and remember too, that in Cholera the contraction of the capillaries is universal, and not as in the other diseases usually followed by the spontaneous relaxation of which we have spoken—the *non inventus* of which, taken in connexion with the universality of the contraction, furnishes a mark of distinction between it (Cholera) and them.\* When induced, as it sometimes is, almost exclusively by the concentrated energy of its own peculiar or specific cause (if such a cause it has), the contraction of the capillaries is so vehement as to stop at once or arrest speedily every organic action, and either cause death instantly, or in a very short time. Or if the contraction be not so vehement, it may be so persistent as to interrupt functions essential to life, and destroy the patient, not so soon, but as certainly. Results analogous to these are sometimes occasioned by the causes, when highly concentrated, of malignant or malarious diseases, in which, as in Cholera, the spontaneous relaxation of the capillaries never takes place, consequently the patient soon dies. In numerous instances in Cholera, and likewise

\* In some cases, this relaxation and subsequent excitement do succeed to an attack of Cholera, as noticed hereafter.

in malarious, and even infectious diseases, predisposing causes may act powerfully and give a strong predisposition, and yet the disease not be induced, unless an exciting cause, as a debauch, exposure to cold, or fright, is superadded. Again—those predisposing causes may be so accumulated or concentrated, as to become in themselves exciting causes, by which their respective diseases are produced, with little aid from any other agent as an exciting cause:—or indeed the common exciting may become the predisposing causes which give the system so strong a proclivity to the disease in question (Cholera), as well as others, that it will be induced by even a very trifling application of its own peculiar cause. When attacks of Cholera are brought on in either of these ways, a more favorable result may be anticipated, than when chiefly induced by the concentrated energy of its specific cause. The reason for this has already been assigned. These, with many other considerations, go far to show that Cholera is very like other endemic diseases, which have never been suspected of being infectious or contagious.

Like most other diseases, Cholera has its predisposing and exciting causes;—a proximate and also perhaps a specific cause, and is probably a disease *sui generis*.

The predisposing causes produce a state of body which gives it a proclivity to a disease, which is technically termed the pre-disposition. As we progress we shall endeavor to show what is the precise condition of the system which constitutes the predisposition to Cholera.

The predisposing causes are of two kinds, the common and the specific.

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## I. THE COMMON PREDISPOSING CAUSES

Tend to produce other ailments as well as Cholera, and in all cases act in the same manner.

All the causes belonging to this class are indigenous, and under certain circumstances to which we shall allude become exciting causes. Poverty with all its attendant ills, privation, starvation, bad food, bad air, bad lodging and clothing, previous sickness, affections of the mind, intemperance, fatigue, exposure to cold, night air, &c.



That these causes are all indigenous and invariably present in every place where Cholera has prevailed; that its prevalence has been commensurate with their existence, and that it has never prevailed to any extent, if at all, in the absence of these causes,—are facts of the highest concernment and furnish matter for profound consideration, not to medical men only, but to all, and *particularly to our city authorities*, who are principally responsible for the existence of some of those causes, and moreover for the consequences that will inevitably accrue from the neglect to have them removed should the Cholera prevail in this metropolis. Impressed by the importance of this subject, we shall examine, *seriatim*, but briefly, these causes, and explain the manner in which they act in predisposing to Cholera, and in co-operating with the specific cause in the production of that disease.

We start with the broad comprehensive proposition, that they all produce one common effect—a general contraction of the capillaries over the body, which constitutes the predisposition.

The paleness, if the capillary contraction is only of short continuance;—the emaciation, diminution in size, weight, &c., if more persistent, are proofs sustaining this allegation. In the production of that effect, each cause operates in its own peculiar way; therefore we shall consider them singly and in succession.

### 1. *Deficiency of food; or hunger, and its effects.*

When food is being taken into the stomach, the pleasant impression which it makes on the palate causes the capillaries and their pores to relax, and allow the fluids to pass into the fauces, &c., and when it is received into the cavity of the organ, it makes a pleasant sensation there which causes its capillaries to relax, and the organ doing as a whole what all its vessels do, relaxes, and continues to do so until its muscular coat is put on the stretch by the mechanical distension of the food, and the sense of repletion is experienced—an intimation that enough has been eaten. The pores looking into the cavity of the stomach also relax, and the gastric juice is secreted. Digestion begins, and as it progresses the stomach contracts and forces its contents through the pylorus until it is completely emptied. It may now relax spontaneously, which prevents the sense of hunger from being perceived; but

this relaxation will be followed by an increased admission of blood into its capillaries, and especially into those belonging to the muscular coat, and the organ now again contracts painfully, and gives rise to the sensation of hunger.

If now, food or anything which makes a pleasing impression on the inner surface of the stomach, or a pill of opium, whose narcotic influence blunts the sensibility of the part, which is equivalent to a pleasing impression, the organ as a whole relaxes, and the sensation of hunger goes off. If nothing be taken, and the meal time is passed, the stomach relaxes spontaneously, and hunger ceases to be experienced until the approach of the period for taking the next meal, when the stomach contracting gives rise to the same painful sensation. Now, the reception of food is what is intended by nature to cause this change by which hunger is removed, and which we have no doubt consists in a relaxation of the vessels and of the stomach as a whole. If this physical agent is withheld, the capillaries of the stomach will become more and more contracted, until the patient experiences a sort of feeling as if the stomach and bowels were fastened to the back-bone.

The food withheld, the capillaries over the whole body doing sympathetically what those of the stomach and bowels do, that is, contract, hence the pallor which is always, sooner or later, the concomitant of hunger. Again, chyme and chyle are not formed, and consequently not absorbed—the vessels of the viscera are destitute of what should distend them and become permanently constricted—hence the emaciation. When this state of the system, which constitutes a strong predisposition, exists, the slightest possible application of the specific cause will be sufficient to bring on the disease. Or if the Choleraic agent exerts only a very moderate influence in conjunction with the predisposition induced by the predisposing cause under consideration (deficiency of food), the addition of any of the commonly exciting causes will insure an attack.\*

\* Philosophically considered, how is hunger relieved by taking food? The pleasant impression of food upon the palate induces the vessels of that part and of the salivary glands to relax and admit more blood, and more saliva is secreted, because all that is necessary in order to increase the function of an organ, whether of secretion, sensation, or motion, is a moderately increased

2. *Bad Food and bad Air.*—When these causes operate, the chyme and chyle are vitiated, and the nutrient matter they furnish is impure. The fluids are soon altered in their chemical and physical properties, and by their irritating qualities produce a contraction which not only interferes with the process of nutrition, but with all the functions, consequently affecting the general health, and bringing the system into the condition exactly suited to take on the disease when subjected to the influence of the specific cause, hence the great liability of persons thus circumstanced to an attack, prior to which, let it be kept in mind, the equilibrium between the vessels and the pores was not disturbed; but became so, immediately on the application of the specific cause, when the disease may be said to have set in. The several ways in which bad air operates to predispose to the disease, that is in producing this contraction of the capillaries in which the predisposition consists, are too well known to require comment.

3. *Bad lodging;—deficient clothing, especially in autumn, winter, and spring;—want of sleep, over-exertion and fatigue.*—The pallor induced by the influence of these causes, even when of short duration (as in the instance of one or two nights' watching), indicates a contraction of the minute vessels which, as in all the other instances, predisposes to the disease: and furthermore, the intensity

determination of blood to it. When properly masticated, the food passes into the stomach, on the inner surface of which it makes a pleasant impression, which induces that organ, the stomach, as a whole, to relax for the continued reception of the food until the meal is finished—and what the stomach as a whole does, that all its vessels do, and they admit more blood; hence the secretion of the gastric juice which commences soon after the reception of food into the organ, and continues until it is all digested and expelled from it, when after a certain time the contraction is again perceived, the perception of which constitutes the sensation of hunger, which is commonly most urgent, when the usual period for taking food has arrived; or a little after, when the contraction is greatest. If food be still withheld, the stomach relaxes spontaneously, and the sense of hunger goes off, but returns at the approach of the next meal time. The stomach may be made to take on almost any habit of periodicity which will best suit the business habits of each individual, the vessels in other and distant parts doing what those in the alimentary canal do, and for the same reason—the want of material for distension; emaciation becomes the secondary and invariable concomitant and result of deficiency of food.

of any one of them may prove an exciting cause in the case of any individual upon whom the choleraic poison is operating, so as to give a slight indisposition only.

4. *Previous sickness* has been found a strongly predisposing cause, the effect of which is a contraction of the capillaries, so very like that induced by the forementioned causes, as to render further comment unnecessary.

5. *Affections of the mind*.—Fear ; anxiety and dejection of spirits, which are species of fear more persistent in their character, produce contraction of the capillaries, as is proved by the pallor of those subjected to their influence, and therefore powerfully predispose to the disease. When excessive, these affections and passions very often act as exciting causes, and more especially so, if the predisposition has been derived from the choleraic poison, or specific cause. This passion, fear, above all other disturbing causes, is the best calculated to produce the disease, for it not only causes the capillaries to contract, but induces the pores and *sphincters* at the same time to relax—hence the diarrhœa, and diabetic flow of urine, which so often affect persons subjected to its influence, and so far as my own observation goes, it was the most powerful predisposing, or frequently exciting cause of the disease. In 1832, the predisposition caused by this subduing passion was so strong, that almost any exciting cause, as a night's watching, or a meal of improper or indigestible food, was sufficient to produce the disease in all its horrors;—on the other hand, when the predisposition proceeded from other causes, and particularly the specific, a fright, or anything that occasioned a great or sudden mental depression, was sure to excite the disease.\*

\* This passion, by turning the attention inward, and fixing it on the stomach and bowels, has, in addition to the general contraction of the capillaries which it induces, a great influence as an exciting, as well as a predisposing cause. One lady in full health was introduced to the bedside of a patient in the worst form of Cholera. After witnessing for a few minutes the sufferings, she became sick, and desired to be helped into another room, where she died of the disease in about five hours. By mental sympathy, her attention was fixed on the same parts in her own person as were affected in that of the patient whose suffering she witnessed. If inquired of, the timid will tell you that they are prone to this exercise of the attention, and experience an aggravation of the abdominal uneasiness whenever they think of the viscera alluded to.

### 6. *Intoxicating Drinks.*

The habitual use of these furnished one of the strongest predisposing causes of Cholera. An occasional fit of intoxication, in such as indulged in this most pernicious habit, was of all others the most certain exciting cause of an attack. I cannot call to mind a single instance in which an habitual drinker, after getting drunk, escaped an attack, or one who recovered from it. Although it may not produce any palpable derangement of the health, the habitual use of intoxicating drinks, even if moderate, as in the case of temperate drinkers, so called, induces an irritable state of the capillaries, which inclines them to take on morbid action from trivial causes, and that condition prevents their resuming healthy action when the disturbing cause is removed. In other words, slighter causes bring on disease in such persons, which is not only more difficult to remove by medical skill and remedies, but also more likely to destroy life. For the reason assigned, it will be easily understood why habitual drinkers are so much more certain to be attacked and destroyed by the disease, than the tee-totaller, who so uniformly goes unscathed.\* He that takes a drop of anything that can intoxicate, except as a medicine, has in the opinion of the author "taken a drop too much."

### 7. *Hæmorrhage.*

This debilitates, and exhausts the system, by the withdrawal of its fluids—consequently produces contraction of the capillaries commensurate with that withdrawal.

Spontaneous hæmorrhages are more dangerous and much more likely to give the predisposition, and, in fact, bring on the disease, than such as are accidental or produced by violence. In the former the pores are open (a condition analogous to that which actually exists in Cholera), and allow the blood in its entirety to escape, and the vessels continuing to contract, keep in contact with what remains, be its quantity ever so small; but in this case all the constituents of the blood equally alike escape; and there the analogy ceases. In Cholera, the colorless portions only are strained out,

\* It is said that now and then one of this class has been attacked—but I have not the shadow of a doubt that such had been guilty of some imprudent act, violating the laws of health, and by so doing invited the attack.

and the residue, partaking of the nature of venous blood, remains in the larger vessels, and acts as a poison on parts with which it is in contact. In this, as in other instances, the contraction of the capillaries constitutes the predisposition—the flow of blood the predisposing cause. In spontaneous hæmorrhages the capillaries of the part whence comes the blood are, from some cause or other, over-distended, which prompts them to contract, and if they do not contract violently, the pores will relax and allow the blood to pass, which makes room for more and more to be admitted into the vessels; so that the fluids of the body, in accordance with hydraulic principles, finding less resistance in that direction, would all escape, if proper means were not employed, or nature did not interpose to prevent such an untoward result. In both the accidental and spontaneous hæmorrhage, as the contents are withdrawn the vessels contract and keep in contact with those which are left.

#### 8. *Exposure to cold.*

All are familiar with the fact that cold produces contraction of the capillaries, and so becomes a predisposing cause of Cholera—but many instances have occurred in which it has acted as an exciting cause. In such the predisposition has been the work of the specific, while an additional degree of contraction, produced by the exciting cause, exposure to cold, ushered in the disease.

#### 9. *Exposure to the night air.*

It seems to have been a well ascertained fact that Cholera, like endemic diseases, “generally makes its attack in the night towards morning.” No reason known to the writer has been assigned why this time for attack should be chosen. To him the following exposition has seemed the most philosophical. Natural sleep is caused by the relaxation of the capillaries of the brain and nervous centres first—next of those belonging to the organs of animal life—and lastly, of those appertaining to the organs of organic life, but in a less degree in the latter. During the exertions of the day all these vessels are more or less under the influence of the will and other exciting causes, which are wholly, or in a great measure, abstracted and cease to operate during the night; on that account they forego their resistance and suffer themselves to be distended, by which



the parenchymatous substance of the brain is compressed and sleep ensues. Commensurate with that distension and compression is the progress of sleep from slumbering, dozing, moderate insensibility, to deep sleep, coma, &c., and in the same degree is one function of animal life after another interfered with and suspended, until the abolition of all is complete, when the body, failing to be supported by the muscles of volition, subsides into the recumbent posture, which facilitates the additional flow of blood into and retards its egress from the brain. Moreover, favored by this position, the heart continues to force the blood into the capillaries of the brain, and likewise into those of other parts connected with animal and also organic life, whose organs, although they do not suspend their operations during sleep, perform them less actively and vigorously, and in that way share in the benefits of sleep, which constitutes the only kind of repose they can enjoy, but which is nevertheless essential, for without it the machinery of life would soon cease to move.

By the concurring influence of the forementioned causes, the natural and ordinary sleep which we are now considering is rendered more profound, and might be detrimental, and even fatal, if nature had not devised a method by which it is commonly terminated at the proper time. The distension caused as above described, continues to increase, until the vessels of the brain, and, indeed, of most other parts connected with animal life, become more and more distended and stretched, till active resistance is excited; and then contraction, which causes uneasiness and sometimes pain, awakes the sleeper. This period of energetic contraction arrives sooner in some individuals than in others, but generally towards morning, when people who "follow nature" become uneasy and begin to awake.

Thus far all is well—the relaxation, distension, compression, contraction, and attendant circumstances, as detailed, are normal, and would induce neither cholera nor any other malady without the concurrence and co-operation of another exciting cause or extraneous agent, which prevents the contractile effort just mentioned from stopping at the point where it has performed the duty assigned, i. e. when it has wakened the sleeper. This cause is a

change in the temperature of the atmosphere, which takes place simultaneously with that in the body. This atmospheric change consists in a fall of temperature and consequent condensation and deposit of moisture during the night, and particularly the latter part. Owing to this diminution of temperature in the surrounding air, caloric leaves the body, which causes the cutaneous capillaries to contract still more, and with increased energy. Induced by the joint influence of these two causes, to which is usually added that of other predisposing and exciting causes, and, above all, that of the specific or choleraic agent, this contraction, "about three or four o'clock in the morning," ushers in the nocturnal attack of cholera, and likewise that of many other diseases, beginning with a chill.\*

With respect to them the contractile effort, as in cholera, does not stop with the awakening of the sleeper; but, influenced by the co-operation of the predisposing and exciting causes, whether of fever and ague or of any other disease, it goes on with increasing energy until those affections are induced. In cholera, although the disease commenced at the time stated, the cold stage is not often fully established until after the lapse of several hours. So the cold stage of fever and ague and of other fevers does not often manifest itself before nine or ten o'clock in the morning, or later, according to the type. It will be seen that this view of the subject is in strict accordance with those already taken in regard to the predisposing and exciting causes to which allusion has been made. The coincidence of this contractile effort of the capillaries at that period of the twenty-four hours when the temperature of the atmosphere and the condensation of its moisture are at the lowest point, secures that degree of capillary contraction which, with the co-operation of the other predisposing and exciting causes, renders the influence of the specific poison so certain, that persons if only slightly predisposed will be attacked at the time specified. Many, it is true, are assailed during the day, but in such cases the disease springs from some special and strongly exciting cause, as intoxication, fright, over-exertion, &c.

\* This view of the subject suggests the propriety of an extra blanket at night applied at least over the inferior extremities.



This explanation affords some important practical deductions, of which we shall avail ourselves when we come to consider the treatment.

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## II. OF THE SPECIFIC CAUSE OF CHOLERA.

Concerning this agent we are in the dark ; but are much inclined to consider it a predisposing, rather than a necessarily exciting cause. In whichever light it is viewed, it is consoling to know that it is seldom, if ever, so highly concentrated as to produce the disease without the concurrence and co-operation of some one or more of the causes belonging to the class which we have just been considering ; but when so concentrated as to become the real exciting cause, it seizes its victim without the least premonition, and hurries him with relentless fury and awful celerity to "that lone land" from "whose bourne no traveller returns." But it is comforting to know that such instances are very rare ; and that, although millions may fall by the sword of the destroyer, yet the cases just alluded to are almost, if not quite, the only ones necessarily fatal. Without offering, in this place, anything relating to this strange mysterious agent, we shall proceed to analyze the phenomena which it produces, and try to deduce from them something concerning its nature, and the laws by which its influence on the human body is governed, and the principles of practice on which we should rely in the treatment. Here, however, a difficulty meets us on the very threshold—it is that of discriminating between the phenomena which proceed directly from the specific cause, and those produced by the modifying influences of the other causes ; and also, between those induced by other causes, modified by the choleraic or specific cause. The premonitory symptoms, as they are technically called, arising, as we believe they do, from the common predisposing and exciting causes, furnish the best and most characteristic mark of distinction, which is of the utmost practical importance.

Like the predisposing and exciting causes which we have been considering, and also like those of epidemics and endemics, this specific cause or choleraic agent produces a vehement contraction of the capillaries throughout the whole body, especially those portions of

it which belong to animal life ; but in one respect its effect differs from that of the others, and is indeed peculiar to itself. With this constriction of the minute vessels, it also causes a *relaxation of the pores*, particularly those opening into the stomach and bowels, through which the colorless, serous, and saline constituents of the blood escape into those viscera, and leave the system destitute of materials essential to the performance of the vital functions. This last circumstance, the relaxation of the pores, we repeat, is the great leading mark of distinction between the effects of this and the effects of the other causes, which we have considered as predisposing and exciting, and, indeed, of all other morbid agencies ; and in that circumstance, viz. the relaxation of the pores taking place simultaneously with the contraction of the capillaries, consists the peculiar and specific action of this choleraic agent, and it is this anomalous and unique effect which constitutes cholera a disease *sui generis*.

It is true that we have the contraction of the capillaries, and occasionally a relaxation of their outlets from other causes, as when cathartic medicines are administered ; or when causes of diarrhœa exist within the alimentary canal,—which irritate the mouths of the exhalants (as tobacco irritating the extremities of the salivary ducts causes an increased flow of saliva), and cause them to pour out their contents, hence the diarrhœa from such causes. But the diarrhœas from fear and the application of cold to the surface are more analogous to that produced by the specific cause of Cholera, than those produced from the causes just mentioned. In all the cases mentioned, the diarrhœa is generally either mucous or purulent, and therefore does not much involve the capillaries which circulate the albuminous, serous, and watery portions of the blood ; neither does it affect so great an extent of the mucous surface of the alimentary tube.

Let us now examine the symptoms and phenomena ; 1, with a view to their cause ; 2, to the proximate cause of the disease ; and 3, to the treatment.

In a great many instances, perhaps a majority, the disease seems to commence in the organs of animal life, hence the languor, paleness, and contracted state of the features which often precede an attack. This Choleric expression was so remarkable that the

accession of the disease was often anticipated, and in some cases, as the writer believes, prevented. The shrinking of the cutaneous capillaries which belong to animal life, constitutes a most remarkable feature of the disease, and is the physical cause of one of its prominent symptoms—the sensation of cold. In Cholera, this sensation is no error of perception, for the temperature of the body, internally as well as externally, is excessively lowered, and the capillaries no less excessively contracted, as may be inferred from the coldness of air breathed from the lungs, and the corrugated, shrunken appearance of the surface. We know no appliance to the body that can produce this effect. External agencies seem to be utterly incompetent,—the cause must then be one acting from within, and here again we are constrained to acknowledge our ignorance of any substance taken into the system which can produce such a result. Nothing but caloric leaving the body (and in Cholera it escapes with a wonderful facility), can produce this general reduction of temperature with which the capillary contraction seems to be exactly commensurate; but the mere abstraction of caloric does not—cannot produce the phenomena of Cholera, because life would be extinguished before the capillaries of the internal organs could be made to feel its influence; besides, Cholera, like intermittent and endemial fevers and diseases, invades the system at times and under circumstances which preclude the possibility of an abstraction of caloric which could *per se* produce the shrinking of the capillaries and other phenomena. The analogy must not, however, be permitted to escape us. Cold applied to the body, or more scientifically speaking, caloric abstracted from its surface, produces a contraction of the cutaneous capillaries, and also those more deeply seated, which forces the fluids inward upon the capillaries of the mucous membranes, and causes them to be slightly over-distended, but not enough to induce the pores opening into the intestinal canal, to resist, and hold fast, because, owing to the unvarying warmth of the part they are ever ready to relax, and do relax as the capillaries contract; hence, the looseness which is so apt to follow the simple exposure of the nude body to the cold water, or the cool air preparatory to bathing, and explains the reason why cold is so often an exciting cause of Cholera. In the same way, and on the same

principle, is the quantity of urine increased and the desire to micturate from a similar exposure.

Analogous to this effect of cold is that of fear, which produces a contraction of the cutaneous capillaries, and a relaxation of the sphincters; hence the diarrhœa, and desire to micturate when persons are much under its influence, complaints said to have been prevalent among the higher officers engaged in the late "patriot war" along the Canada frontier. Men of great *laxity*, they were undoubtedly thoroughly predisposed, and would certainly have had Cholera, had it been at all prevalent. This explains the fact why fear is one of the most powerfully exciting causes. The specific cause, whatever it may be, produces a peculiarity of effect which constitutes Cholera a disease *sui generis*; but it must be admitted that the causes of other diseases do sometimes produce analogous effects.

Some have supposed the specific cause to be a change wrought in the constitution of the blood; but that hypothesis falls to the ground when we consider the fact, that the disease is very certainly arrested and cured in its premonitory stage, by remedies which cannot be supposed to operate any change whatever in the physical or chemical properties of the blood; and moreover, that it is occasionally recovered from in all its stages, under the use of means which effect no such changes.

Besides, it is said that persons in perfect health have been attacked—and also that recovery is now and then sudden; facts inconsistent with the idea of the existence and removal of such a condition of the blood.\*

Man in his wisdom is prone to look beyond the simplicity of nature, in the explanation of the phenomena which she presents, and more particularly so, when the phenomena of disease are concerned; but the writer, after much reflection, has at length settled down upon what seems to him to be the most simple and common sense view of the subject, which is that the specific cause of

\* That the blood does undergo changes during the progress of the disease, is not to be questioned. That fluid drawn soon after the attack is natural—but if at a later period, "dark, black, tarry—thick, ropy, syrupy, semi-coagulated," changes owing mainly† to the straining out through the pores, of the colorless and serous portions of the blood, as the disease advanced.

Cholera is the concurrent influence of all or most of the predisposing and exciting causes of that malady, while those agencies whose tendencies are to counteract that influence are absent. Not that the concurrence of all is necessary to the production of the disease in each individual case, but that the existence of all, or nearly all, is necessary, as in other epidemics, in order to render the disease general. When these causes exist in any place, it may be expected that Cholera will soon be there. When they are removed in season (and they are all indigenous, and under our control), the disease either does not make its appearance, or soon disappears. When it breaks out under such circumstances, the timid should flee and the poor be removed.

We have shown in a former part of this paper, that the predisposing and exciting causes all concur in producing a contraction of the capillaries; but that the disease was not produced, unless the pores opening into the alimentary canal were relaxed. It may be a question, to what class of capillaries do these pores belong? We answer: not to those which perform the ordinary functions of secretion or excretion, which pertain to the lining membrane of that canal, but to those that circulate the colorless fluids, as the albumen, serum, and fibrine—constituents of the blood. When the contraction of the capillaries over the system which belong to this class takes place, and the above mentioned pores connected with them in the mucous membranes relax, we have Cholera. Another question arises, How are we to account for the coincidence of the contraction of the capillaries, and the relaxation and opening of the pores?

We will venture to suggest that the concurrent influence of the causes to which we have alluded as the specific cause, when it produces the disease, does it by disturbing the equilibrium between some of the imponderable agents which pervade the human frame, in common with everything else, a disturbance which is capable of extinguishing life, or greatly deranging its functions.\*

\* Perhaps philosophy may yet disclose what will be in perfect keeping with the simplicity of nature, that these imponderable agents called caloric, light, galvanism, electricity, magnetism, &c., are only modifications of the same agent, and governed by the same laws. Probably this opinion now prevails.

## SYMPTOMS.

In Cholera we have nausea, vomiting, and purging, with violent cramps in the stomach and gripings in the bowels, also dreadful spasms in the muscles of the abdomen and limbs, and various other symptoms not imputable to the specific cause alone, and therefore explicable on other principles, a consideration of importance in relation to the treatment.

1. *Vomiting and purging* —What the capillaries of the stomach and bowels do, no matter from what cause, that will those viscera as entire organs do; therefore when those vessels contract and force their contents through the pores into the cavities of these viscera, they (the viscera) will be prompted to contract as wholes by this contraction of their vessels, and by the contained fluids, which act by their irritating qualities, and likewise by their bulk, in both ways exciting the stomach and bowels to violent efforts for their expulsion; hence the vomiting and purging, and, when violent, the cramps and gripings, so characteristic of cholera. The quantity of contents produces mechanical distension, the natural stimulus to the muscular fibre, hence the muscular coats of those organs take on abnormal actions which are so painful and overwhelming.

2. *Cramps and spasms*.—Now, according to a law of sympathy, when the muscles in one part become inordinately affected, those in other parts, from similarity in structure, are in like manner affected. In Cholera the muscles of locomotion do what the muscular tissues of the stomach and bowels do, consequently cramps and spasms manifest themselves in the limbs, which result from the contractions of the capillaries of those muscles, in accordance with the law that muscles as wholes do what all their capillaries do. These cramps are, however, very unlike the spasms in epilepsy and convulsions, which are instituted by nature as remedial measures for relieving the congested state of the brain, by deriving blood from that organ into the muscles of locomotion.\* In Cholera these

\* This is on the principle that increasing the function of an organ within certain limits augments the determination of blood to that organ. hence in epilepsy and convulsions the abnormal action of the muscles causes an increased quan-



irregular movements arise from the violent efforts of the muscular capillaries to follow up their contents, which are being so rapidly withdrawn. They resemble the convulsive motions of animals dying from loss of blood.

3. *The Small Feeble Pulse*—is owing to the contracted condition of the capillaries of the heart ; a condition sympathetic of, and analogous to that of those vessels in other parts. In this case, the heart, doing what all its capillaries do, becomes so contracted that it cannot send the blood to distant parts with sufficient force to overcome the contracted state of the capillaries (its antagonists), over the whole system, even if this extraordinary capillary resistance did not exist—hence the pulse not unfrequently ceases to be perceptible several hours before death. Desperate as the case may seem, if the capillaries relax, the patient may recover. It is then proper to keep up to the last external warmth, dry friction, &c., which promote relaxation.

4. *Dyspnœa*.—"The Dyspnœa, the high and rapid breathing, and intolerable sense of oppression," arise from the contracted state of the capillaries of the lungs, and also of the muscles of respiration, sympathetically produced ; \*the former excluding blood from those organs, and thereby preventing its due aeration ; and the latter, the proper performance of the respiratory act, so far as it depends on the apparatus essential for that function.

5. *State of Mind*.—The capillaries of the brain, the organ of mind, like those of other parts, are in a state of inordinate contraction, as may be inferred from the constricted, shrunk, shrivelled, and pallid appearance of the face and features, which is usually a sure index to the circulation of parts within the cranium, because both derive their blood from the same vessels. The state of

tity of blood to be derived to them, and in the same proportion as blood is admitted into them is it withdrawn from the brain—hence the relief experienced by that organ. In this, nature does what the practitioner does with his lancet, leeches, scarificator, pediluvium, frictions, &c. A resort to these means proves that he has rightly interpreted the indications and language of nature. In many instances a liberal dose of opium, when immediately preceded by a full bleeding, by the general relaxation it produces, puts an end to the convulsions or epileptic paroxysm.

the mind, which is somewhat analogous to that of a person suffering from extreme cold or a serious injury from external violence.\*

I have often made the comparison, and contemplated the resemblance with great interest, as a proof of the condition of the encephalic capillaries. The disease advancing, the patient, though not insensible, is indifferent to everything about him,—has little perception—little volition—is indisposed to action or exertion, and, therefore, performs no intellectual operations, although conscious of whatever is passing around him. He usually retains his mental faculties, though in a subdued condition, to the last; but is exceedingly disinclined, or probably unable, to exert them—the contraction of the cerebral capillaries being too strong to be overcome by any effort he can, or is disposed to make. Indifferent and unconscious, he seems to wait the catastrophe in a kind of insensate, non-caring mood. To obviate, or prevent the approach of this state of things, the most strenuous endeavor should be made to keep up confidence in the use of efforts and remedies. So long as the patient himself, who is probably not as indifferent as he appears, hopes, there is hope in his case; when he despairs he will certainly die—do what you will.

6. *Insensibility*.—Nearly allied to, and perhaps dependent on, the foregoing, is that want of sensibility which is so frequently witnessed several hours before death, which is owing to the parts connected with animal life having been deprived of their arterial blood by the contraction of the capillaries;—the sensibility of a part being in direct proportion to the quantity of arterial blood

\* We are told that patients, particularly in India, while walking in the open air, fell down with symptoms of "vertigo, deafness, and blindness," and expired in a few minutes. These were examples of the disease being induced by the direct and concentrated agency of the specific cause, whatever it may have been, which produced such a rapid and intense contraction of the capillaries of the brain and other vital organs by sympathy, as to stop almost instantly the wheels of life.

It has been remarked by writers that, when any peculiarity as the above, manifested itself, it uniformly continued to prevail in the places where it first appeared, and, indeed, seemed to be confined to them, a fact which goes to prove that local causes have a strongly modifying influence over the specific cause and its effects.



circulating in it.\* Deprived of blood, an organ or part becomes insensible. The stomach, when in that predicament, is quite as insensible as the surface to the strongest stimuli.† This insensibility of the stomach does not usually occur until after the vomiting and purging have ceased. Notwithstanding the coldness of the surface, tongue, and breath, the patient frequently complains of a sense of heat and burning at the stomach—circumstances explainable on the principle that extremes‡ often produce similar results.

7. *Deficient Secretion of Urine.*—Owing to the contracted state of the renal capillaries, the blood is excluded from the kidneys, and no urine is secreted; and from a similar condition of those vessels pertaining to the bladder, that viscus, doing what all its capillaries do or have done, is found as a whole in a state of extreme contraction. I have seen it not larger than a butternut, and containing not a single drop of urine.

8. *Secretion of Bile.*—The veins, hepatic and mesenteric, are gorged with dark-colored blood—a necessary result of our theory of the contraction of the capillary system. By the capillary contraction in other parts, the blood is forced inward upon the veins and capillaries of the stomach and bowels, and its thinner and more subtile portions are strained out through the pores into the alimentary canal, while its thicker and grosser parts remain in the veins. Now these veins having no valves, and little support from the sur-

\* The sensibility of a part being modified by the state of its circulation, holds as well in the normal and healthy, as in the abnormal and morbid condition. Witness the bones, cartilages, fibrous membranes, &c., which in a natural state exclude red blood, and are insensible, but if red blood is admitted, as in inflammation, they become excessively painful: other parts, as the ends of the fingers, lips, &c., replete with vessels circulating arterial blood, are acutely sensitive, both in health or disease.

† This insensibility of the skin during the state of collapse, as it is called, is in some instances so great that blisters, and even cloths wrung out in boiling water, make little or no impression. The capillaries cannot relax.

‡ If we apply a piece of frozen mercury, or a piece of iron, heated as much above blood heat (i. e. to  $137\frac{1}{2}$  Fah.) as the mercury when congealed is cooled below, the subject of the experiment cannot tell by the feeling which is the heated iron or the cooled mercury—the sensations and effects will be the same—in both, a blister will be the consequence. This is fully substantiated by the testimony of Capt. Parry. See *Narrative of a Voyage in quest of the North Pole*.

rounding viscera, and also little or no help but rather resistance from the pulmonary and cardiac vessels, are incapable of moving the blood along their trunks, hence their engorgement. In consequence of this excess of blood in the portal and hepatic veins, a redundancy of bile is suddenly secreted, and the gall-bladder no less suddenly distended, or over-distended, and therefore cannot and does not empty itself through its excretory duct into the duodenum, and is consequently found full,\* and no bile in the intestines, and moreover none in the profuse evacuations during the progress of the disease. How in such cases could calomel affect the liver?

9. *Dark appearance of the Skin.*—When the surface of the body exhibits the dark blue appearance mentioned by writers, and *universally* witnessed by all who have seen much of Cholera, the mesenteric, portal, and hepatic veins are seldom much gorged with blood, and *vice versa*—they are generally distended with that fluid when that appearance is absent. This dark-colored appearance, although mentioned by writers as a symptom of cholera, is by no means uniform, or according to the writer's observations, even general—but rather the exception than the rule, and occurs only when the visceral veins are undistended. When absent, the internal veins are gorged;—when present, comparatively empty. Our theory explains this.

10. *Absence of Vomiting and Purging.*—Cases are recorded in which there was neither vomiting nor purging; yet the stomach and bowels were full of the rice water fluid. In such, the emptying of the capillaries of those organs had been effected mainly by the relaxation of the pores without much contractile effort on the part of the capillaries. The exhaustion of nervous power had prevented the contraction of the capillaries, and consequently of the organs themselves as wholes for the expulsion of the fluid. For the reason assigned, these were the most fatal cases. The writer does not remember to have seen an example of the kind.

\* The doctrine is—if a hollow organ, having an outlet, act inordinately and violently, as it is certain to do when suddenly over-distended, the sphincter will not only not relax but hold the more tightly, and absolutely resist the passage of the contents, and retention of urine, as in the case of the urinary bladder, is the consequence—so also is the retention of bile, in the case under consideration.

11. *Manner of Evacuation.*—In manner, the puking and purging were unlike that exhibited in any other disease, if we except Cholera Infantum. The matter is ejected from the mouth as with a pump, and from the anus as by a syringe—in both instances it would seem to be accomplished by the exclusive efforts of the stomach and rectum, without calling into requisition the muscular apparatus ordinarily associated with these operations, and consequently in many instances without much apparent uneasiness, and certainly without that pain and suffering which occur, when parts belonging to animal life are brought into action, as in severe vomiting and purging from other causes.

12. *Stage of Excitement and Nature of the Disease.*—From a consideration of the predisposing and exciting causes of Cholera, the conclusion was drawn that they produced a certain degree of contraction of the capillaries throughout the system, but especially in those portions which appertain to animal life, and that this contraction, i. e. the predisposition, might exist in a greater or less degree, and for a longer or shorter time, without the accession of the disease, which usually followed the application of some strongly exciting cause, or by the accumulated or concentrated energy of the predisposing causes, which it was hinted might in reality constitute the specific cause;—and moreover that unless the pores, connected with the aforementioned capillaries opening into the alimentary canal, relaxed, the phenomena of Cholera would not present themselves, and we now add that not unfrequently diarrhœa (a consequence and proof of the relaxation of the pores) of a premonitory character, in almost every case preceded the attack of the disease proper, and that this premonitory diarrhœa, although it greatly increased the predisposition and danger too, by emptying the vessels, was not characteristic, so long as mucous or fœcal matters only were discharged, but instantly became so when the discharges began to be watery; indicating that they (the discharges) were from capillary vessels exclusively appropriated to the circulation of the serous and colorless portions of the blood. On further examination, we find that the analogy between the predisposing and exciting causes of Cholera, and of febrile diseases, is very striking, and goes far to prove that the former is also a febrile disease, although it does not often exhibit the phenomena

which usually characterize that class of diseases—indeed the resemblance is so strong as to challenge the conviction that it legitimately belongs to the same family, yet it must be admitted that in nearly all cases of pure Cholera, so considered and termed, the stage of febrile excitement never appears.

How shall we account for and explain away this seeming paradox?

In all diseases of a febrile stamp, commencing with chills, whether infectious, as small-pox, measles, &c., or non-infectious, as intermittent, remittent, and other fevers, the rigor depends on the contraction of the capillaries, and the succeeding hot fit on the relaxation of those vessels, spontaneously or artificially induced, which follows the chill or rigor, during which the pores do not relax, nor indeed do they during the hot fit, and not until the heart becomes fatigued with its own exertion and acts with diminished energy, when we have the sweating stage. But in Cholera, while the capillary contraction is universal and intense, the pores looking into the intestinal canal do relax, open, and allow the watery portions of the blood to pass in ten thousand streams, by which the system is drained; and the capillaries, exhausted of their contents, cannot relax, but are actually compelled, by a law which obtains in the vascular system, to continue contracting more and more in order to keep in contact with whatever fluids remain. Hence the inability of the capillaries, in most cases of Cholera, to relax spontaneously, and also our inability to induce them to do so by artificial means, therefore the febrile excitement does not take place,\* but as if to establish the doctrine of identity of this disease with fever, yielding of the capillaries does sometimes take place, and a series of consecutive symptoms follow;—the disease then assumes the type of congestive fever, which is not unfrequently fatal, although some-

\* The capillaries, like other hollow organs, have no positive power of relaxing and distending themselves—they can only forego their resistance and allow themselves to be distended; but in Cholera, for the reason assigned in the text, there is no distending force acting from within, therefore the constriction remains, and interrupts or stops entirely the functions of life: here again the analogy holds, for in some attacks of intermittent fever, in which the vessels never relax, the patient dies during the cold fit—but in these as in all others, during the cold stage of fever, the capillaries are so contracted that the fluids cannot reach the pores, and there is therefore no discharge. †

times cured. Indeed, we do not recollect any instance of recovery from what could be called Cholera proper, except through this stage of excitement. Such cases were considered of a milder grade. It is worthy of notice that this relaxation and excitement, if we may be allowed the expression not unfrequently occur after death (the effusion through the pores having ceased with, and often prior to that event), which accounts for the return of color and heat on the surface, and the muscular contractions also, which are more evanescent than the heat and color. These *post mortem* contractions are not produced, like the *ante mortem* cramps and spasms, by contractions in any particular muscle or part of a muscle—they are not indeed truly spasmodic, but resemble the contractions which occur in epilepsy or convulsions, in which the whole muscular apparatus connected with a limb is called into action, and by which the member, as a whole, is moved. They are not unlike the movements excited by the galvanic battery. The *ante mortem* cramps and spasms arise from the contraction of the capillaries of the muscles, occasioned by the withdrawal of their fluid contents, while the *post mortem* movements exhibited in the defunct are caused by the contraction of the capillaries, excited by the inflowing of blood, their natural stimulus,\* which is admitted in consequence of the spontaneous relaxation which succeeded to the death struggle. The withdrawal of a portion of the principle of vitality (the *vis vitæ*) which belongs to, or rather sustains animal life, leaves the capillary vessels free to relax, and suffer themselves to be distended—hence the flush, returning warmth, and also the motions of which we have spoken. If now this distension could be kept up by the transfusion of blood, or any substitute capable of

\*The arterial blood distending the muscular capillaries, is the primeval stimulus which excites the muscles to action. In the fœtal state, the muscles of locomotion begin to contract as soon as red blood is admitted into their vessels, and as these multiply and enlarge, the movements of the limbs become stronger and stronger, and at length constitute the epoch in fœtal life termed quickening—prior to which, however, a sense of motion, like that of worms quiggling and nestling about in the womb, is almost always perceived by the mother, and is one of the most conclusive and certain early signs of pregnancy previous to quickening. Feeling these internal movements, women sometimes think they are troubled with worms when they are not.

sustaining these movements, might not resuscitation in some instances at least follow ?

13. *Collapse*.—To this term, “collapse,” we object. Taken in its strict legitimate or radical meaning, there seem to be no phenomena in Cholera which warrant its use. Let us see. It is derived, as all know, from *collabor*, “to fall together as the sides of a vessel,” indicating that they do so because they have not the ability to keep asunder ; but in Cholera the sides of the capillaries are brought together, not from want of power, but with resistless energy—by that very contractile effort which is one of the essential ingredients—one of the pathognomonic symptoms of the disease, a condition without which the disease could not exist. We therefore suggest that the term is not correct in its application, and liable to lead to errors in practice.\*

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#### THE PROXIMATE CAUSE.

This we conceive to be a general or universal contraction of the capillaries, and particularly those which circulate the serous and colorless constituents of the blood, with a relaxation of the pores belonging to the same class of capillaries, which open into the alimentary canal. This contraction of the capillaries forces the blood inwards, and produces a congested state of the vessels of the abdominal viscera, the colorless portions of which, however, pass into the capillaries without distending them so suddenly and violently as to induce their pores or sphincters to resist, and refuse to let them (the serous portions) pass, which accounts for the immense quantity of aqueous matter discharged from the stomach and bowels. This contraction of the capillaries and relaxation of the pores constitute the proximate cause, or, in other words, that phenomenon in the body most immediately preceding the state which we call Cholera, and without which that disease is not known to exist.

\* Under certain circumstances the sides of the stomach, and the veins especially, after death fall together ; but the capillaries never do that, either in Cholera or any other disease.



## INDICATIONS OF CURE.

These, whether preventive or curative, are deduced from the proximate, predisposing, and exciting causes. If the latter are removed the disease does not occur, neither does it supervene if the contraction of the capillaries or the relaxation of the pores is prevented. If the capillaries are made to relax and the pores to contract, the disease is either certainly cured, or passes into the congestive form, in which case it is the more manageable. In a former part of this paper it has been shown that all the predisposing and exciting causes of Cholera tend to produce, and actually do produce, a contracted state of the capillaries, which, we said, constitutes the predisposition.

These (the predisposing and exciting causes) should, therefore, be all avoided, or removed, if practicable, and their effects, *i. e.* the contraction of the capillaries, obviated. During the prevalence of Cholera persons should be particularly careful to avoid exposure to cold, which exerts a powerful agency in producing that contraction, and to keep themselves warmly clad, rather more so than usual, or than may seem absolutely necessary, the propriety of which will be obvious from the certain tendency of warmth to keep the cutaneous capillaries relaxed and distended. During the night care and caution should be taken to prevent exposure to cold or damp; "by night or noon" they should be most scrupulously guarded against. It is not necessary to particularize in this place, as the exciting and predisposing causes have been considered at great length, to which the reader is referred.\*

Various methods of treatment have been recommended, adopted, and praised, among which is blood-letting, calomel in large—enormous doses, calomel and opium in doses small or liberal; tart. emetic; stimulants,—as large quantities of brandy, &c., &c. So far as the author's observation goes, when the disease has fairly set in one method of treatment is about as good as another, and none of

\* Radishes, cucumbers, pease, which we observed produced Cholera in 1832, more certainly than any other vegetable dish; all unripe fruit, decaying vegetables, &c., oysters, lobsters, clams, most fresh fish, veal, &c., should be placed in the same category—improper food.

them of much value, except so far as they tend to keep up hope and confidence in the patient.\* Others were, however, of a different opinion, and have reported considerable success to have followed their respective modes of treatment. We shall, therefore, examine briefly into the grounds of that success.

Remembering that relaxation of the capillaries, on the one hand, and stopping the effusion of fluids through the pores, on the other, are the objects to be aimed at; let us inquire in what way they are to be accomplished by blood-letting.

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### *Blood-Letting.*

During the cold fit of an ague the capillaries are so contracted that the fluids which circulate in them cannot reach the pores; hence the dry skin, dryness of the throat, and consequently thirst, paucity of urine, and absence of all tendency to discharges from the alimentary canal. If this condition of things could be produced in Cholera, the same result would certainly follow; and I doubt not it may be sometimes brought about in that disease by blood-letting, which, by promptly emptying still more the blood-vessels, causes in them a more vigorous and sudden contraction, which prevents the fluids from reaching the pores; and furthermore this sudden additional contraction may be all that is wanting in order to secure the spontaneous relaxation which in common, ordinary cases so readily follows the extreme contraction of the capillaries from other causes. Governed by this theory, the writer was led to adopt the practice of blood-letting in the cold fit of intermittent fever, as recommended by Mackintosh, and in every case with entire satisfaction. He has often seen the fit stopped before half a pint of blood was drawn, and the whole disease cured, as it were, from that moment, subsequent fits being prevented by proper treatment. His reasoning was, that, if the capillaries could be made to contract

\* It is said that in 1832 it was announced in Quebec or Montréal that a certain individual, not a doctor, had an infallible remedy for Cholera,—that he administered it with the most wonderful success,—until it was found out to be nothing but finely pulverised charcoal and milk. The confident, the certain expectation of being cured by it did more for the patient than the remedy.



only a little more, the period of their utmost contraction, which ordinarily took place immediately prior to the commencement of the hot fit, would be anticipated, and the spontaneous relaxation immediately follow, and such was the uniform result. On this principle, benefit from venesection may be expected. During the prevalence of Cholera in 1832, not having sufficient confidence in the principle as applied to that disease, the practice was not fully put to the test. In the few cases in which it was tried the result was in its favor, so much so as to incline the writer to think favorably of it.

#### *Large Doses of Calomel.*

Some practitioners gave calomel in drachm doses and some by the half ounce, and as they say, with advantage. If beneficial, it must have been because the calomel in large quantities and too heavy to be ejected, came in contact with the pores opening into the stomach and bowels, and stimulated them to contract and stop further effusion, upon what principle I cannot tell. The solution of tart. emetic, which in the hands of some practitioners is said to have been followed with considerable success, acts by causing a contraction of the capillaries of the stomach (its true physical effect), which was sufficient to prevent their contents from reaching the pores, and also that additional contraction spoken of under the head of blood-letting, which is followed by spontaneous relaxation.

#### *Opium.*

If we could get narcotics into the system in sufficient quantity to prevent the capillaries feeling the impression made on them by causes which induce their contraction, or would incline them (the capillaries) to forego their contraction, they would relax—perhaps so rapidly as to become over-distended, when the pores would resist and stop the further escape of serum, &c. When opium operates in this way, it is very efficacious in arresting internal hæmorrhages, especially from the uterus. I have often seen opium in small doses, as a single grain, beneficial when given immediately after each ejection from the stomach or rectum.

## CURABILITY OF CHOLERA.

The principal reason why Cholera, when once fairly set in, is so unmanageable or incurable is, that all remedial agents introduced into the stomach and bowels are prevented by the aqueous matter, and its frequent ejection, from coming in contact or remaining long enough in juxta-position with their inner coats to have any medicinal effect whatever.

If this be a correct view, prevention is almost our only hope; and it is good to know that this may be accomplished by the removal or avoidance of the predisposing and exciting causes, or by attending to the premonitory symptoms, particularly the diarrhœa, which in every case that came under the writer's notice, preceded the accession of the disease proper, and which according to his experience was always under the control of medicine.

In Cholera, as in diarrhœa and dysentery, there are three indications. 1. Constrict the pores. 2. Relax the Capillaries. 3. Keep the patient perfectly quiet.

In the diarrhœal stage, the writer found the acetate of lead and opium quite adequate to the fulfilment of the first and second indications. His method was to give the former in one and a half or two grain doses, with two-thirds of a grain, or a whole grain, of the latter after every discharge, or as frequently as the exigencies of the case demanded. A single dose often answered the purpose.\* Calo-

\* Having employed the acetate of lead as an internal remedy more than any other practitioner within the circle of his acquaintance, the writer feels it to be his duty to add a few observations in regard to its value and safety in common diarrhœa and dysentery. His practice in those complaints, and particularly the latter if severe, is to confine the patient absolutely to the bed and in the recumbent posture, from which he should not depart even to evacuate the bowels or bladder. If allowed to sit on the stool, as is usually done, the action of the glutei muscles, through the fascia connected with the sphincter ani muscle, and also the perineal fascia, which every anatomist will understand, tends to relax and open the passage, so that while it facilitates the operation, the very thing not desired, it also favors the descent of the intestine, and if persisted in often produces prolapsus. When the patient is not allowed to have a passage, except in the recumbent posture, he finds more difficulty in accomplishing it, and is, therefore, more willing to resist calls to evacuate, in which he should be strongly urged to perse-

mel, in doses of ten or fifteen grains, with three or four of opium, is not unfrequently prescribed for the purpose of promoting the

vere. If there is nausea, and good reason to believe that it is caused by any offensive matter in the stomach, it should be removed by an emetic of Ipecac and sulphate of zinc. Eschewing all cathartic medicine, I begin with the acetate of lead and opium. If the disease is severe the first dose should consist of two or three grains of opium, and four or six of the acetate, after which the subsequent doses may be regulated, as to quantity and frequency, by the exigencies of the case; but I have invariably found it best to make a strong and decided impression at first. If the primary dose, so far as the narcotic is concerned, is larger than the case actually demands—no matter—the system will be the more amenable to subsequent doses, which may therefore be smaller. By adopting this method, the less medicine on the whole will be required, and the disease more promptly and certainly cured. Some practitioners are in the habit of giving calomel and opium in dysentery. In my opinion, all the good that is done by that combination is accomplished by the opium, while I would not be answerable for the mischief done by its adjunct. Why give calomel? We are told that it is to correct the secretions, and particularly those of the liver. In all cases of fever as well as dysentery, in which the secretions are morbid, the acetate of lead with opium is a better medicine for effecting a change in them than calomel, or indeed any of the preparations of mercury. The diarrhœa and bowel affections which so often make their appearance in typhus and typhoid fevers, and give both the practitioner and patient so much trouble, and are so dangerous to the latter, should be met at the very threshold—not with calomel—or cathartics, but with the above-mentioned remedies, in sufficient doses effectually to control them. Cathartics, and particularly calomel, should be most scrupulously avoided. Deprecating the approach of these untoward symptoms, I have not unfrequently let patients with typhus fever go five, six, and sometimes eight days, without any evacuation from the bowels, and never had cause to regret it. In such cases the physician should always have the sagacity to discover when a laxative is required. With a little educating the nasal organ will give the hint, and generally “smell out” the necessity for opening medicine. In dysentery, physicians are, I know, much in the habit of giving cathartics to bring away the lumps of fecal matter, technically termed scybalæ; but, in the early part of my practice, having great curiosity to see these offending matters, I instituted a rigid course of inquiry and observation in order to detect them; and, after a considerable time, failing to do so, came to the conclusion that there must be some mistake in this matter, and that cathartics were not required for the removal of what did not exist, and of course left off ordering them in that complaint, and have had no cause to regret the omission. The most abundant experience has satisfied me that in diarrhœa and dysentery the bowels should be kept still, on the same principle that we would keep an inflamed limb quiet. Injections, except such as contain anodynes and those very small, should not be given. Even the latter,

secretion of bile, &c. If the state of the liver and gall bladder is as has been described, we would in candor ask how calomel or any other medicine can emulge the liver. On another account, we think calomel in the early stages altogether objectionable. We have no drug which is more apt than calomel to excite an excretion of fluids into the intestinal canal—the very thing of all others in Cholera, or in cases tending to it, to be avoided—just what should be prevented or stopped—why then give calomel? That this practice has been sometimes successful is undeniable; but the success we apprehend was owing to the opium and not to the calomel, but in spite of it; the former did good in its own way, and moreover obviated the bad effects of the latter. The acetate of lead may be combined with a sudorific, with great advantage.\*

To answer the 3d indication, the patient should go to bed and remain there warmly covered, twenty-four or forty-eight hours, after the diarrhœa has entirely ceased; and he who will not do this, should be told in the plainest language by his physician that he will not be responsible for consequences. Within the twenty-four hours

as a general rule, should be omitted. Sudorifics containing opium are of great importance. Venesection, cupping, leeching, &c., &c., as demanded by the exigencies of each individual case, must be resorted to. Mucilages for nourishment and “*sheathing*” the bowels are recommended and given, as if the stomach and bowels were in a condition to make use of food! The digestive powers gone, these substances become subject to chemical action, and therefore do nothing but mischief, by irritating surfaces already too irritable. When the power of digestion is absent, nutritious matters are uncalled for. Liquids may be given in small quantities at a time. Astringent infusions—the best of which is strong green tea, sweetened or not, with or without cream—as best suits the patient’s taste, may be taken; it is often very grateful, and may be given freely in the morning, and fore part of the afternoon. Flannel, worn next the skin, is one of the best preventives of dysentery, during the prevalence of which it should not be dispensed with by the well or by the sick.

\* R. Opium, }  
 Ipecac, } grains 4.  
 Camphor, }  
 Acet. of lead, ℞ss.

Mix intimately and divide into 6 equal parts. The patient (in bed) is to take one, and the others in succession—say one after each evacuation from the bowels. When the diarrhœa has stopped, which it will generally do after the administration of the first powder, the powders may be taken every 6th hour, the acetate being left out.

after the cessation of the discharges, a laxative of castor oil (the best) or rhubarb may be directed, if deemed necessary,—the patient keeping in bed a day or two after its operation, in order to make the cure certain and permanent. The recumbent posture will be of great utility in every case, and in many the *sine quâ non* to a happy result, to which the quietude and warmth of the bed no doubt contribute much.

When the symptoms peculiar to Cholera have become manifest, we are much inclined to think that the treatment under which the patient is most likely to recover, will be to disturb him as little as possible—to administer such things only as seem to be most agreeable and comforting to him. Pleasing impressions induce relaxation of the capillaries. To make such appliances as are calculated to have the same effect, viz. gentle friction under the bed clothes,—moist applications, the tendency of which is to lower the temperature of the body by evaporation, should be withheld; to preserve the confidence of the patient, and especially his hope, which being a pleasing passion, also tends to produce relaxation, it may be well to keep up the appearance of doing something, without in any degree interfering with his comfort. Enemas should not be administered. He should not be annoyed in any way. In some cases, I think I saw some benefit derived from administering six or ten grains of the acetate of lead dissolved in a table-spoonful of water, with ten or twenty drops of laudanum, immediately after each vomiting.

From what he witnessed during the visitation of the Cholera in 1832, the writer is convinced that vastly too much was done by doctors and nurses. They seemed to think that this gigantic disease, this “monster malady,” could be cured only by main strength, and therefore gave nature no chance; whereas the most judicious course in many cases would have been “to stand still and let the patient get well” if he could. When we do not know what to do, wisdom dictates that we do nothing. We do not mean to insinuate that patients would have recovered if they had been less severely doctored; but we do say that many were doctored too much.



## APPENDIX.

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UNDER existing circumstances, cholera furnishes a subject which very properly engages much of the attention of the medical profession, not only in this city, but probably throughout the country; and it is to be confessed and regretted that the opinions of the faculty in regard to its nature and mode of propagation, and also its treatment, are far from being accordant and settled. Disturbing and deranging the business of a whole community, and causing loss of life and property beyond calculation—and hovering, as it does, at this time, over this city, or actually (this paper was written in December last) prevailing in it, as some believe and assert, its mode of “personal communicability” is a matter of grave and solemn import, well calculated to excite emotions of the deepest interest. In its mode of communication, is it not reasonable to suppose that it will act in obedience to the laws which govern other diseases belonging to the same class? Is it then contagious? Is it infectious? The reader’s attention is asked to what will be offered in relation to these interrogatories. So far as the author knows, the views to be presented have never been entertained by any other person; he therefore solicits that they may be considered with candor.

### I.—IS CHOLERA CONTAGIOUS?

Its cause, like other epidemics, is unknown to us, consequently we can gather no information from that source; but with its phenomena we are all familiar, either from reading or personal observation, and by comparing them with those which essentially and invariably accompany diseases, known and acknowledged to be



contagious diseases, we shall probably find data sufficient for the solution of this question. In order then to set up a standard, by which to try this "monster malady" in this particular relation, we must ascertain and determine what is a contagious disease.

In scarcely any instance is the language of common conversation, or even that of ordinary professional parlance, sufficiently definite and exact for scientific purposes, and this circumstance, probably more than anything else, has been the cause of so much discrepancy of opinion and angry discussion among medical men in respect to the contagiousness of this as well as of other diseases. Even contagion and infection, familiar to the profession as household words, have never yet had precise and definite meanings attached to them; in many instances they are regarded and used as synonymous and convertible terms, hence the confusion and uncertainty so apparent when these topics are discussed; on that account we see gentlemen, in attempting to avoid one error, continually running into another. The only way of escaping these evils is to fix the meaning of those terms, and then we may determine what is a contagious or what an infectious disease.

Contagion is the transmission of a disease from one person to another by contact, *i.e.* through the medium of the touch. Now, the skin is the only part of the body designed by nature to come in contact with surrounding matters—with the material world; it is therefore the organ of touch, and consequently the seat of contagious disease; it must be so; for how can one individual come in contact with another, so as to communicate a disease, which is communicable by contact only, except by touching his skin? It must be skin to skin, so that the matter capable of producing the disease, can pass from one skin and fix itself on another. This may be termed communication by "direct contact;" but the disease may be contracted, imparted, or communicated by wearing apparel, or sleeping in sheets to which the contagious cause adheres; in that case, however, the cause comes in contact with the skin of the individual exposed. In both instances the cause and the subject may exist, but contact is the *sine quâ non* of the disease.

We say, then, that a contagious disease is one which attacks the skin; is always produced (if produced at all), in all persons, in all



climates, all seasons, and under all circumstances, by the contact only of the same, single, identical cause, which cause affects all obnoxious to its influence, always in the same way and manner, but which never contaminates the system. A disease which never confers on the individual who has been subjected to its influence, or rather, who has once had it, the slightest immunity from subsequent attacks, but which of the two renders him rather more susceptible, somewhat in proportion to the number of times he has been affected; a disease that never gets well of itself, and therefore "has no tendency to a spontaneous cure;" a disease which "is never developed spontaneously, and is not epidemic or endemic;" the cause being obviously insufficient for such results.\* Always arising from the same cause, it is ever the same. By way of illustration we take scabies as an example—a complaint whose contagiousness is unquestioned and unquestionable—with which all are familiar, either by personal experience, or from personal observation, and is therefore well suited to our present purpose. The skin, as has been observed, is the only part of the system designed by nature to come in contact with, or receive impressions from surrounding substances, and as this affection can be produced by the *contact* only of its own peculiar exciting cause, it follows that that particular structure or organ is the invariable seat of this malady, which may extend over the whole external surface of the body, "except the face," but to no other part. If applied to the inner surfaces, as the mucous membranes, the cause would at once be destroyed or rendered inert by influences to which, under such circumstances, it must be unavoidably subjected. This distemper is, as all know, caused by an insect, the *acarus scabiei*, which, coming in *contact* with the cuticle, penetrates it, and excites inflammation and intolerable itching, and it is acknowledged and admitted by modern pathologists, that it can be produced in no other way, and by no other cause;† that it spreads to various parts by the insect being transferred to, and brought in *contact* with them in divers ways. It "has no tendency to a spontaneous cure," and therefore never ceases but by the use of remedies; it never contaminates the system nor the atmosphere, and is not

\* Contagious diseases are indeed few in number.

† This opinion is not quite universal.

epidemic; nor does it afford the sufferer any exemption or immunity from subsequent attacks.

We shall bring forward but one other disease as illustrative of our present position, the *porrigo favosa*, the contagious nature and character of which will not be questioned or doubted, and is therefore adapted to our purpose. Unlike scabies, *porrigo* is caused by a vegetable parasite, which, coming in *contact* with the surface, fixes upon a spot, penetrates the cuticle, excites inflammation, itching, &c. This parasitic vegetable produces no other disease, nor is this disease produced by any other cause, nor in any other way even by this, but by contact. Like scabies, it spreads over the surface, but is confined to the skin, and therefore never contaminates the system or atmosphere, has no tendency to spontaneous cure, and is never cured but by remedies; when once cured, it affords the patient no immunity from subsequent invasions. Uncomplicated, it always exhibits the same phenomena in all subjects, under all circumstances, climes, and seasons. These two distempers furnish perfect examples of contagious disease, (for which purpose alone they have been introduced,) compared with which cholera has no symptoms in common.

Now, can we pronounce a disease which has no analogous feature—no characteristic symptoms in common with another, to belong to the same class—to be of the same species? If the views we have taken of contagion and of contagious diseases be correct, are we—can we be justified in saying that cholera is contagious? Besides, it is acknowledged that persons may have cholera who have never been in contact, or even within many miles of any one afflicted with that malady, or anything impregnated by emanations from the sick; facts which, it would seem, furnish a most conclusive and unanswerable argument against its being contagious, in the strict and legitimate sense of the term. Is not utter impossibility implied?

## II.—IS CHOLERA INFECTIOUS?

Coming to another class of diseases, we find it necessary to settle with definite and technical precision, the meaning of terms.

We define infection\* to be the communication of a disease by the introduction of a virus generated in the living body, which contaminates the system into which it is introduced and received, and causes the phenomena of that disease to appear, and, moreover, a matter identical with the virus introduced; accordingly, it is quite immaterial how this poison or virus gets into the system. We proceed, then, to characterize an infectious disease to be one which arises from a substance received into the body, which, by contamination in a peculiar manner, produces in every stage a series of analogous consecutive morbid actions, which are the same in all the corresponding stages; the product of which is a virus identical with the substance originally received, and which, of course, is capable of exciting the same disease, or series of morbid actions and phenomena, in other individuals,—a disease which, unlike those proceeding from contagion, “has a tendency to a spontaneous cure,” and also affords immunity from subsequent attacks. To this, however, there are numerous exceptions; enough, perhaps, to warrant the division of this class of diseases into two or more species, but this, although a matter of great scientific interest, comes not within the scope of our present purpose.

We shall take, for examples and illustrations, three diseases, with which all are familiar, and about whose characters for “personal communicability,” there is nothing equivocal, ambiguous, doubtful, or uncertain, viz. small-pox, measles, and cow-pox. We have selected them for one other reason,—they are held to be contagious;

\* Infection is from *infectio*, to stain or dye. It has the radical sense of *in* and *facio*,—to make in. “To infect, is to thrust in.” The infecting cause must get *into* the system, or it cannot contaminate it. “During the scarcity of copper coin before the establishment of the mint, the common council of the city of New York emitted little bills of credit, of one, two, and three pence, made of thick bibulous paper. They became dirty, worn, and impregnated with everything they could wipe from human fingers,” in which condition “they were carried to the City Treasurer’s office to be exchanged for new ones. The Treasurer threw them into a close desk. This collection was made during the hot weather in summer. After many weeks the Treasurer opened the box, and began to unfold and unroll the dirty bills. *A disagreeable and noxious vapor proceeded from them, which poisoned him, and nearly deprived him of life.*” This was an example of infection. The noxious vapor which poisoned the Treasurer was taken up and carried into the system by the pulmonary absorbents.

the two former are also considered to be infectious as well as contagious, while the latter (cow-pox) is pronounced "only *contagious*, not *infectious*," by high authority in these matters;\* a proof of the very loose manner in which professional men have been in the habit of thinking and writing on these topics.

But are these diseases contagious? 1. Is small-pox contagious? Does its virus produce the disease by simple contact, direct or indirect? We will not demand of our friends, the contagionists, a categorical answer to this last interrogatory; but say what they say, that there are three ways or modes of communicating the disease with tolerable certainty, and also another, of very questionable character, which we will proceed to examine.

1. Small-pox may be communicated to the *fœtus in utero*, and that too when the mother, having previously had the disease, remains perfectly free from every symptom of that distemper. In this case, the variolous matter is received into the maternal system, and transmitted through it to the *fœtus*. As this excludes the possibility of contact, or of any artificial means of communication having been employed, it may be emphatically styled "the natural way" of getting the small-pox.†

2. By inhaling air impregnated or tainted with the variolous poison, which is diffused through it in a state of the minutest possible division. In this way, the matter is conveyed to the pulmonary absorbents, taken up, and carried by them into the system, which in process of time becomes contaminated and poisoned. By this method a much greater quantity of virus finds its way into the system—hence the greater severity of the disease thus induced. In this case the matter comes in contact with the surface of the body, and also with that of the mucous membrane of the bronchiæ. The former (i. e. contact with the surface) constitutes, as we have seen, the very essence, the *sine quâ non* of contagion; but we have, in addition, its contact with the pulmonary tissues which makes "assurance doubly sure;" yet if it is not absorbed no disease

\* See Elliotson's Practice, by Stewardson, p. 444, and also p. 309.

† It is impossible to furnish a stronger proof of the fact that infectious diseases (a certain species of them at least) do afford immunity from subsequent attacks—or in other words, destroy the susceptibility of the system to the impression made by that particular poison.

will ensue, as would have happened if the affection had been of a contagious nature. Although in contact, if unabsorbed, the matter excites no morbid action whatever, and is therefore not contagious.

3. By breaking the cuticle and bringing the liquid virus in contact with the cutaneous absorbents, which take it up and convey it into the system, which becomes contaminated. Communicated in this way, the disease is much milder than when communicated in the second mode, because less matter is received into the system—the effect of a poison or of a medicine being in the common sense way of reasoning and philosophizing somewhat in proportion to quantity or dose. This is called “the mode by inoculation.”

4. Dr. Gregory tells us that the matter of the pustules or scabs may be applied to the unbroken surface of the skin or to the mucous membrane of the nose, and be absorbed.” “This,” he says, “is called the mode by contagion:” “but,” continues he, “it must be admitted that the terms contagion and infection are often used indiscriminately to express the silent, or as we say casual reception of the germ.” Coming as it does from the pen of a distinguished professor and author, this quotation may be deemed and taken as a fair specimen of professional accuracy. It shows clearly the difficulty we wish to get rid of. Let us examine Dr. Gregory’s “mode by contagion.” “The matter of the pustules or scabs,” says he, “may be applied to the unbroken surface of the skin.” How is it to “be applied to the unbroken surface of the skin,” while the cuticle remains entire? \* If the cuticle is broken, and the matter applied to the unbroken surface of the skin, it amounts, *de facto*, to inoculation, and absorption of course would follow; but if there was no absorption, then there would be no disease, as we have already affirmed, and have a right to infer from Dr. Gregory’s own statement; but if it had been the matter of contagion the specific disease would have ensued without absorption. “Applied to the mucous membrane of the nose,” how, we would

\* The cuticle is an insensible “*unorganic body*,” which (according to Cruveilhier) is moulded upon the surface of the dermis and its papillæ, like a coat of varnish, and protects them from the action of external agents; and we add more particularly of such “external agents” as are capable of being taken up by the cutaneous absorbents. It is unnecessary to recount the experiments which have been made from time to time, in reference to this question of cutaneous absorption.

ask, could it be so applied, and the effluvia not find the way into the lungs—be absorbed, and carried into, and throughout the system? Again, if “applied to the unbroken surface of the skin,” and kept there long enough to infect the system, through the unbroken cuticle, would it not likewise find its way into the system by the pulmonary absorbents?

Suppose the leg or arm of an individual, or indeed the whole body, covered with the scabs or the liquid virus, or exposed to an atmosphere saturated with variolous matter, would he be affected if the cuticle remained whole—the head being excluded, and the air he breathed “pure as the breath of heaven,” or at least untainted with the miasm of small-pox? We know of no instance on record or not on record, in which the disease has been communicated under such circumstances, and we do not believe that it is communicable by contact, so long as the respiratory organs are insulated, and the cuticle remains unbroken.

We shall push the argument no further, and therefore refrain from examining the two other diseases named. Suffice it to say, that like small-pox they are infectious, not contagious: that they are produced by the absorption of a specific virus, and exhibit symptoms of fever and inflammation, and a regular series of phenomena; and that they afford an immunity from subsequent attacks, and have a tendency to a spontaneous cure—circumstances which separate them as by an impassable wall, from contagious diseases. Like small-pox, the vaccine disease and measles furnish perfect examples of infectious maladies.

If they are infectious, then others which have not their characteristic features, or, indeed, a single symptom in common with them, cannot by any rule of philosophizing or of classification with which we are acquainted, be arranged with them, and called infectious. If so, are we justified in pronouncing cholera an infectious disease? Besides, it is admitted by all, that cholera may and does break out under circumstances which preclude the possibility of its having been produced by the absorption of a specific virus, and also that it terminates in a manner different from what it would if produced by a specific poison; that its progress, spread, stay, and departure, are all unlike what might be expected of an infectious disease.

If cholera is not produced as infectious diseases are,—if it does not



exhibit the same or analogous phenomena,—if it does not march in the same train, and is not followed by the same results, where then is the propriety of arranging it with them as of the same nature? If I were to show you, kind reader, a piece of metal, and tell you it was a specimen of the California gold, would you take it to be gold if the yellow color and other attributes of that metal were absent?

So, if I were to show you a disease, and tell you that it was infectious, and you should ask—was it caused by the absorption of a specific virus generated in a living body?—has it usually exhibited symptoms of fever and inflammation?—does it afford immunity from subsequent attacks?—has it a tendency to a spontaneous cure?—does it originate spontaneously?—is it uniformly or generally followed by the same results? No. Then I trust you would not pronounce it an infectious disease, for the plain and simple reason that it did not exhibit the phenomena or possess the essential attributes of a disease of that character.



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